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CAN INSECTS SURVIVE FREEZING?

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An article on this same subject written by H. H. Lyman appeared in this journal in 1892. Lyman discussed the subject rather fully and cited the literature up to his time. He came to the conclusion that freezing is not necessarily fatal to insects.

Since the paper by Lyman (1892) further work has been done on the subject of insect freezing. The most outstanding piece of work is that of Bachmetjew (1901). He published a series of papers dealing with freezing and allied subjects but summarized his work in 1901, in his "Experimentelle entomologische Studien vom physicalisch-chemischen Standpunkt aus". His contribution to the study of insect freezing lies in two directions (1) method and (2) general conclusions and applications. He used the thermoelectric method for determining the freezing points of insects. This method depends upon the principle that if two unlike metals are fused together an electric current is set up at the point of junction when that point is heated or cooled. The current set up is proportional to the degree of temperature change. The set-up used by Bachmetjew consisted of two fine points made of copper and constantin in series with a galvanometer. One point was placed in a bath of ice and water at a constant temperature of zero degrees centigrade, and the other point was placed in the insect to be tested. The freezing and the undercooling were measured on many different species in all stages of development. Bachmetjew came to the conclusion that death of the insect was caused at reaching the undercooling point the second time. Thus essentially the limit of undercooling and not freezing in itself caused the death of the insect.

The work of Gueylard and Portier (1916) is important for the emphasis it placed on periodicity or increased cold-hardiness with winter temperatures and loss of cold resistance in the spring. They used the larvae of *Carpocapsa* and of *Cossus*. With regard to the question, "can insects survive freezing?" they came to a positive conclusion if congelation can be taken as equivalent to freezing. These two contributions, that of Bachmetjew and that of Gueylard and Portier are selected from references on insect freezing on account of their definite applicability to the subject in hand and also for their quantitative handling of the subject.

To the question Can Insects Survive Freezing, no definite answer can be given until a definite understanding on the word freezing is made. Merely for an insect to survive at temperatures below the freezing point of water does not indicate that an insect can survive freezing of its own tissues. Congelation and marked stiffening can take place without freezing. Freezing in this paper will be considered as actual crystallization of tissue or body fluid or both, accompanied by giving off of heat.

The method used by the writer in determining the freezing points of insects was essentially that of Bachmetjew. Cooling of the insect was accomplished by means of evaporating ether in the cooling chamber or when lower temperatures were required by the use of carbon dioxide gas expanding through coils surrounding the insect to be tested.

Certain insects in two groups, those of the lake dwellers or *temnitic* species, and those in the group of stored products pests, were unable to freeze without dying. The aquatics tested were *Anax*, *Sympetrum*, *Leptocella*, *Phryganea*, *Neuronia*, *Ischnura* and *Enallagma* in the Neuropteroid group; *Dytiscus*, *Gyrinus*, *Coptotomus*, and *Halipus* among the Coleoptera, *Belostoma*, *Notonecta*, and *Buona* among the Hemiptera. All of these insects died upon being frozen. The Coleoptera and Hemiptera were in the adult stage and the Neuropteroids were larvae or nymphs. The stored products insects that were tested were as follows—*Pyralis farinalis* Linn, *Tribolium confusum* Du Val., *Tenebrio molitor* Linn., and *Calendra granaria* Linn. These experiments indicate that certain groups of insects are unable to withstand freezing. The lake dwellers are normally exposed to temperatures no lower than zero centigrade throughout the year unless they are caught in the surface ice. The stored products pests are normally protected from extremes of low temperature and do not exhibit a high degree of cold resistance. The white marked spider beetle and some species of *Trogoderma* may prove to be exceptions to this general rule. It is possible that these species may survive freezing.

There exist a large group of insects normally exposed to low temperatures in the winter time. Cutworms, bark beetles, and many lepidopterous pupae that are hung on branches and thus are exposed to extremes of low temperatures belong to this group. Of these one group, the oak borers, has been extensively studied. The species studied were protected only by a thin layer of bark and were often surrounded by ice crystals in the winter time. These insects exhibited a periodicity in their cold hardiness, i.e. they were more cold resistant in the winter time than in summer. They became cold resistant in the fall, only to lose this property in the spring. Some of these insects, *Dendroides canadensis* Neum. and *Elater* species, were able to survive freezing in the winter. This freezing point was recorded as the actual rebound point with heat given off at the time of freezing.

Thus to the question Can Insects Survive Freezing, the answer can be given that not all insects can endure freezing nor can insects withstand it throughout the year, but in certain groups normally exposed to low temperatures, there are insects that can freeze without dying.

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NOTES ON CHAOBORINAE (DIPTERA, CULICIDAE)

BY ROBERT MATHESON,

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In a recent paper by Dyar and Shannon* there is presented an excellent study of this group. Unfortunately there are some errors in synonymy which I desire to correct at this time before they become too fixed in our literature, and also add some distribution data. I have recently made a study of all our available eastern species and I have before me all of Dr. Felt's and Dr. Johannsen's type material together with European material kindly sent me by Mr. F. W. Edwards of the British Museum. In this material I have males of all our species and a study has been made of the genitalia which is to be published at a later date. *Eucorethra underwoodi* Underwood.

Ithaca, N. Y., Apr. to Oct., 1924; Utica, N. Y., June 1923; Douglas Lake, Mich., July, 1922.

Corethra culiciformis De Geer.

The synonymy of Dyar and Shannon agrees with my study of the types.

Ringwood, N. Y., May 10, 1921; Elizabethtown, N. Y., May to Aug., 1904-05; Old Forge, N. Y., July 25, 1905.

Corethra cinctipes Coq.

Ringwood, N. Y., May and June, 1922.

Corethra fuliginosus Felt.

Nassau, N. Y., June 12, 1905; Big Moose, N. Y., June 11, 1905.

Chaoborus crystallina DeGeer.

Sayomyia rotundifolia Felt is a synonym of *C. crystallina* DeGreer as shown by a comparison of the types with European material. The rest of the synonymy of Americian species as given by Dyar and Shannon is incorrect.

Karner, N. Y., July 7 and Aug. 2 and 8, 1904; Ithaca, N. Y., Sept. 3.

Chaoborus americanum Johannsen.

Corethra plumicornis var. *americana* Johannsen, N. Y. State Mus. Bul. 68:395, 1903.

Sayomyia americana Felt, N. Y. State Mus. Bull. 79:368, 1904.

Sayomyia hudsoni Felt, N. Y. State Mus. Bull. 79:371, 1904.

This species was described by Johannsen as a variety of *Corethra plumicornis* Fabr. In 1904 Dr. Felt recognized it as a distinct species under the name *Sayomyia americana* Johans. In the same publication he described a new species, *Sayomyia hudsoni*. I have before me the types of both these species. The genitalia of the males are identical in every detail and the synonymy should be as shown above. This species is very distinct from *C. crystallina* DeGeer.

New Jersey, Illinois, Minnesota and New York (Johannsen); Karner, N. Y., June 5, 1912; Staten Island, N. Y., April, 1920; Elizabethtown, N. Y., July 15, 1905; Old Forge, N. Y., July 14, 1905; Poughkeepsie, N. Y., June 16, 1905. *Chaoborus punctipennis* Say.

Old Forge, N. Y., June-Aug., 1905; Poughkeepsie, N. Y., June, 1904; Long Lake, N. Y., Aug. 13, 1885; McLean, N. Y., Aug. 6, 1924; Ithaca, N. Y., Sept.

*—Dyar H. G. and Shannon R. C. The American Chaoborinae. Ins. Ins. Menst 12: 201-216, 1924.

3; Spring Creek, Decatur Co., Ga., July 1912; Billy's Island, Okefenokee Swamp, Ga., June-July, 1912.

Chaoborus festivus Dyar and Shannon.

I have before me a single female which undoubtedly belongs to this species I had set it aside hoping to secure a male before describing it as a new species. The distribution is interesting, Canal Zone, Panama, and Georgia.

Billy's Island, Okefenokee Swamp, Ga., June, 1912.

Corethrella brakeleyi Coq.

Billy's Island, Okefenokee Swamp, Ga. June, 1912.

NOTES ON THE DISTRIBUTION AND HABITS OF SOME FLORIDA COLEOPTERA WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY,

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I arrived at Dunedin, Fla., on November 15, 1923, and was in the field much of the time about there until March 10, when I started on a three-weeks' collecting trip to southeastern Florida. My first stop was at Miami, where for three days I enjoyed the hospitality of Director G. F. Mozzette at the South Florida U. S. Entomological Laboratory, meanwhile collecting in and about the margins of what remains of Brickell's Hammock, once a noted collecting ground for transient entomologists, but now in great part occupied by the mansions of the high and mighty. From there I went to Royal Palm Park, a tract of 4,000 acres controlled by the Florida Federation of Women's Clubs. It lies in the edge of the everglades, about 60 miles southwest of Miami, 20 miles west of Homestead, and 40 miles east of Cape Sable, at which latter place I collected for a week in 1919.

The main attraction at the park is Paradise Key, an island in the everglades, in great part covered by a dense hammock of 400 acres in which grow many tropical and subtropical trees and shrubs. Among them are 80 or more indigenous examples of the Royal Palm, the most magnificent endogenous tree of the Western Continent, their tufted crowns rising 75 or more feet above the tops of the great live oaks and other hard wood trees of the hammock. The branches of the latter are covered by a dense growth of orchids and epiphytes, while the ground beneath is thickly carpeted with ferns of many kinds. The hammock is surrounded on three sides by the low lands of the everglades, covered with water to a depth of several feet the greater part of the year, but dry at the time of my visit, and thickly dotted with clumps of saw-grass and other semi-aquatic vegetation. To the west of Paradise Key and separated from it by a slough a third of a mile in width is Long Pine Key, another everglade island whose vegetation is mainly grasses and herbage of a prairie type, but with many scattered Caribbean pines arising from the thin-soiled surface of limestone rock. There is on Paradise Key a Lodge or hostelry where excellent accommodations can be had by tourist or naturalist. Here I made my headquarters for 14 days, collecting in the hammock, in the surrounding everglades or on Long Pine Key. The weather had been abnormally cool for several weeks, a frost occurring on March 14, the day of my arrival, and only one slight rain fell during my stay. As a consequence the beetles and Heteroptera, for which I was

primarily in search, had not come forth from their winter hiding places, and my catch was therefore less than it would have been under normal weather conditions. However, I collected at the Park about 340 species of beetles, 65 species of Heteroptera and 35 of Orthoptera. Many of the beetles and bugs were tropical forms, some of them not before recorded from this country. It is mainly of the distribution of the rarer Coleoptera taken at Miami and the Park, as well as those collected about Dunedin both before and after the trip, that this paper treats.¹

(348). *Dyschirius curvispinus* Putz.—Three examples of this little Carabid were taken at Royal Palm Park; one at electric light in my room at the Lodge, the others by sifting dead leaves in damp places. It is shining ferruginous in hue and the front tibiae each end in a long curved spur. Known heretofore only from Texas.

(846). *Tachys albipes* Lec.—This species probably occurs throughout Florida as I have it from Ft. Myers, Royal Palm Park, Little River and other points in the southern part of the State, and Leng in his "Carabidae of Florida"², mentions several stations in the northern portion. It occurs at electric light and beneath cover in damp localities and is known only from Florida and Louisiana.

(1173). *Omaseus (Pterostichus) ebeninus* Dej.—A single specimen, the first one taken by me in Florida, was found at Royal Palm Park, beneath a board on the marly bed of the everglades. Ft. Capron and Tampa are the only previous known stations for the State.

(1228). *Loxandrus rectangularis* Lec.—Originally described from two specimens taken at Enterprise and not since recorded. For that reason Leng, loc. cit., p. 579, regarded it as "possibly a synonym." A single individual was taken at Royal Palm Park from a mass of decaying marl-encrusted *Chara* by the side of a ditch. It is slightly larger (7.2 mm.) than Leconte's types (6.5 mm.), but otherwise agrees in all respects with his description and there is no doubt of its validity.

(1662). *Lebia lecta* Horn.—This minute Lebiid was described³ from a unique taken in Florida without definite station, and has since been recorded only from Key Largo, that State. A single example was taken at Miami, March 11, while beating along the margins of Brickell's Hammock. The specimen is only 3 mm. in length and is the smallest *Lebia* in my collection.

(1724). *Plochionus amandus* Newn.—Both this species and its var. *discoideus* Schaupp occur on the dead leaves of the cabbage palmetto. One typical *amandus* was beaten from a leaf still attached to the tree at Royal Palm Park and three of the variety were taken at Miami by beating a bunch of the fallen leaves.

(1759). *Eucaerus varicornis* Lec.—Two examples were taken at Royal Palm Park while sifting debris from about the roots of a bunch of saw-grass on the edge of the everglades.

(1760). *Pentagonica flavipes* Lev.—A single specimen, the first one taken by me in Florida, was beaten from a dead air-plant at Royal Palm Park. It

1.—In the notes which follow the sequence and usually the nomenclature is that of Leng's "Catalogue of the Coleoptera of America North of Mexico," and the number in parenthesis before each name is the serial number of the species in that work.

2.—Bull. Amer. Mus. Nat. Hist., XXXIV, 1915, pp. 555—601.

3.—Trans. Amer. Ent. Soc., XII, 1885, 131.

is the typical color form with upper surface wholly piceous and legs pale, while those from Indiana have the thorax yellow. It has a wide range but appears to be everywhere very scarce.

(1864). *Anatrichis picea* (Mots.)—Three examples were taken at Royal Palm Park from beneath boards under a bridge across a slough of the everglades. Recorded heretofore only from Arch Creek and Everglade, Florida, and known elsewhere only from Texas.

(2397). *Bidessus pullus* (Lec.)—This little Dytiscid was taken by scores at Royal Palm Park from a roadside ditch in the limestone. On pulling out a mass of Chara and placing it on a board this and other small aquatic beetles crawled out of the mass much faster than I could pick them up. It is a small (1.8—2.2 mm.) nearly uniform pale reddish-brown species with three narrow dark stripes on each elytron and has heretofore been known only from Louisiana and Texas.

(—). *Hydroporus hebes* Fall.—This species, but recently described³, is the form considered by Leng and Mutchler⁴ and myself⁵ as *H. cimicoides* Sharp.

It is a common species in the small ponds and sluggish streams of southern Florida and is known only from that State and Georgia.

(2446). *Hydroporus cimicoides* Sharp.—A specimen of this species, as recognized by Fall, loc. cit., was taken March 18, from a ditch near Dunedin. Fall records a single example from Port Orange and another from Lake Harney, Florida. It is elsewhere known only from Lakehurst, New Jersey and Beaufort, North Carolina.

Hydroporus falli sp. nov.

Oblong-oval, moderately convex. Color a nearly uniform blackish-piceous; head, except an interocular cross-bar, side margins of thorax, palpi and legs dark reddish-brown, antennae reddish-brown, the apical half of joints 4-11 blackish. Upper surface finely alutaceous throughout, feebly shining, minutely pubescent with yellowish appressed hairs. Head very finely and sparsely punctate and with two broad shallow impressions between the eyes. Thorax of the usual form for the genus, margins distinct but not thickened, disk finely, evenly, not densely punctate, the sides minutely strigose. Elytra elongate-oval, rather strongly tapering from middle to apex, more finely and densely punctate than thorax. Sterna and sides of first and second ventrals coarsely punctate, remainder of ventrals minutely and sparsely so. Metasternum sulcate along the median line. Posterior coxal processes more or less angulate medially at tip. Length 4.3 mm.; width, 2.2 mm.

Described from two females taken from the under side of a submerged board in a small pond one mile north of Dundin. Both have been seen by Fall who stated that they evidently belonged to his *undulatus* group, but were unknown to him. Named in honor of my friend H. C. Fall, of Tyngsboro, Massachusetts, who has given me much aid in my study of Florida Coleoptera.

Hydroporus uniformis sp. nov.

Oblong-oval, more convex than usual. Color in life a nearly uniform

3.—Revis. N. Am. Spec. of *Hydroporus* and *Agaporus*, by H. C. Fall, 1923, 29.

4.—Bull. Am. Mus. Nat. Hist., XXXVIII, 1918, p. 84.

5.—Ibid. XLI, 1919, p. 312.

brownish-yellow, becoming reddish-brown when dry; basal margin of thorax, suture of elytra, middle of second ventral, coxae and femora often slightly darker; antennae reddish-brown throughout; upper surface of body clothed with a very fine almost invisible prostrate pubescence. Head minutely, sparsely punctate and with an oval impression each side near front of eyes; margin of clypeus distinctly reflexed. Thorax more coarsely, rather densely punctate, substrigosely so on sides and with a fine preapical transverse impressed line; the side margins somewhat thickened, feebly reflexed. Elytra conjointly oval, their tips rather bluntly rounded; disk finely evenly not densely aciculate punctate. Under surface with pleura and sides of first and second ventrals coarsely punctate, the remainder of abdomen almost smooth. Front tarsi of male dilated beneath to form an oblong-oval concavity, their claws of equal length and thickness. Length 4-4.5 mm.; width, 2.1-2.3 mm.

Described from 20 or more specimens taken at Royal Palm Park, where it was the only *Hydroporus* dwelling amongst the dense growths of *Chara* in the roadside limestone ditches. Mr. Fall, to whom specimens were submitted, wrote that it was "near *lobatus* but apparently different from anything on our list."

(—). *Philhydrus elongatus* Fall.—The type series⁶ of this small pale Hydrobiid were taken at Dunedin, St. Petersburg and Tarpon Springs, Fla., and others at hand are from Sanford and Moore Haven, so that it probably occurs throughout the southern half of the State. It is the pygmy of the genus (2.2-2.6 mm.).

(—). *Philhydrus blatchleyi* Fall.—This recently described species occurs in small numbers in winter, beneath cover along the margins of ponds near Dunedin, the type locality. As Fall suggested, I found three in my series of *perplexus*, from which it may be known by its smaller size (3.5-4.3 mm.), more elongate-oval form and the sinuate inner margins of hind claws of male.

(7232). *Temnopsophus impressus* Sz.—Several specimens were beaten from dwarf cabbage palmettos on Long Pine Key, Royal Palm Park. Described⁷ from Lake Ashley, Florida, and since recorded only from Enterprise.

(7577). *Priocera castanea* Newn.—An uncommon species in Florida. Two were taken from beneath bark of dead pine at Royal Palm Park.

(7716). *Cregya oculata* (Say).—This species varies much in color, one example taken at the Park having the elytra wholly pale, and the thorax with only a trace of the usual dark spots. Beaten from the dead branches of recently felled pine.

(7952). *Macrosiagon (Rhipiphorus) octomaculatum* (Gerst.).—My only example of this species was taken at Dunedin, November 17, while sweeping along the bay front. It is recorded from the State only from Tampa, Gainesville and St. Augustine.

Monocrepidius fuscous sp. nov.

Elongate-oblong, sub-parallel, robust for the genus. Body a nearly uniform dark fuscous-brown, thickly clothed with a fine prostrate yellowish pubescence; antennae, palpi and legs pale brownish-yellow. Front of clypeus broadly

6.—Journ. N. Y. Ent. Soc., XXXII, 1924, 85.

7.—Proc. Amer. Phil. Soc., XVII, 1878, 364.

rounded. Joint 1 of antennae stout, curved, nearly as long as 2-4 united; 2 one-half the length of 3, the latter slightly shorter than 4. Thorax subquadrate, its median length subequal to its width; hind angles much prolonged, acute, but slightly divergent, strongly carinate above; disk finely and thickly punctate, with scattered larger punctures intervening; sides parallel, sinuate near base of hind angles; interval between thorax and elytra wide and deep. Elytra with sides feebly converging from base to apex, striae rather deep, finely punctate, intervals slightly convex, finely transversely rugose. Lobe at base of fourth tarsal joint shorter and not wider than third tarsal. Length 7-9 mm.

A dozen or more specimens were taken from beneath gunny sacks spread out along the margins of a citrus grove near Dunedin. The uniform dark color, pale legs, rather stout form and strongly carinate hind pronotal angles distinguish it from all known species. In form and color of body it resembles our northern *Lacon rectangularis* Say.

(8599). *Monocrepidius suturalis* Lec.—One specimen was beaten from oak foliage near Dunedin, April 6. Listed by Leng only from Alabama and Indiana, but recorded by Schwarz as very rare at Enterprise and Tampa, Florida.

(8994). *Dicrepidius ramicornis* (Beauv.)—A male of this scarce Elaterid was taken from beneath the bark of a dead Caribbean pine at Royal Palm Park. It is a Cuban and South American species known heretofore in Florida only from Tampa and Biscayne Bay. Joints 3-10 of the antennae are strongly pectinate.

Stenelmis fuscatus sp. nov.

Elongate, convex. Body a uniform dark fuscous-brown without trace of pale spots or stripes; legs a paler brown; antennae and tarsi reddish brown. Head with a broad shallow longitudinal interocular groove. Thorax one-half longer than wide; sides parallel on basal two-thirds, sinuate at apical third, disk minutely densely punctate and with a rather deep median groove extending from apical fourth to base and a vague oblique one each side on basal half. Elytra with second interval elevated at base, fifth carinate its full length, striae rather coarsely deeply punctate, the punctures separated by an interval equal to their diameters. Length 3.2 mm.

Two specimens taken from a mass of decaying pond weeds beneath a bridge at Royal Palm Park. The uniform dark color and parallel sides of basal portion of thorax distinguish this from *P. vittipennis* Zimm., its nearest ally.

(9984). *Tenebroides bimaculatus* (Melsh.)—Two examples of this, our smallest species, were taken from beneath the bark of the roots of a dead water-oak on the edge of the bay beach at Dunedin.

(10,036). *Conotelus punctatus* Schaeff.—This form appears to replace *C. obscurus* Er. in Florida. It was taken in numbers by sweeping low herbage at both Miami and Royal Palm Park.

(10,049). *Carpophilus rickseckeri* Fall.—This Nitidulid and *Epuraea luteola* Erichs., were taken in numbers, February 28, from decaying grape fruit in a grove near Dunedin.

(10,103). *Lobiopa insularis* (Cast.)—A West Indian species recorded by Leng from the "Gulf States" but hitherto without definite Florida station. A

dozen or more were taken at Miami from beneath bark in Brickell's Hammock.

(10,234). *Laemophloeus floridanus* Casey.—Described⁸ from a unique taken at Tampa and not since recorded. A single example was taken at light in my room at the Lodge at Royal Palm Park.

(10,265). *Lathropus vernalis* Lec.—One specimen was sifted from leaf debris at Royal Palm Park. Known before in the State only from Crescent City and Dunedin.

(10,275½). *Hemipeplus microphthalmus* (Sz.).—Taken in some numbers both at Dunedin and Royal Palm Park between the petioles and culms of semiaquatic grasses and cat-tails. Its flat body is especially adapted for such a dwelling place. Described⁹ from single specimens taken at Enterprise and Tampa, and not since recorded. The small size, much smaller round eyes and distinct neck easily distinguish it from *H. marginipennis* Lec., our only other eastern species.

***Ephistemus punctatus* sp. nov.**

Oval, strongly convex, more obtuse behind than *E. apicalis* Lec. Brownish yellow or pale reddish-brown, shining; legs pale dull yellow. Entire upper surface coarsely, evenly and sparsely punctate, the punctures separated by more than twice their own diameters. Thorax twice as wide as long, side margins feebly broadly curved. Elytra at base but little wider than thorax, umbones distinct; tips conjointly bluntly rather broadly rounded. Posternum distinctly wider, more convex, its striae less curved inward at middle than in *apicalis*. Metasternum nearly twice as long as first ventral, strongly convex. Length 1-1.2 mm.

Four specimens of this little Atomariid were taken at Dunedin December 11, April 5. Two were found beneath boards on the bay beach, the others were beaten from the dead leaves of sugar cane. The distinct punctures and wider prosternum easily distinguish this from both *apicalis* Lec. and *perminutus* Casey, our only other eastern species of the genus.

***Colydium bicoloratum* sp. nov.**

Elongate subcylindrical. Head, thorax, scutellum, antennae, legs and under surface a uniform reddish-brown; elytra black, shining. Head finely evenly rather thickly punctate and with a vague obtuse median carina. Thorax distinctly shorter and relatively broader than in *lineola* Sy, its sides more convergent from apex to base; disk much more finely punctate than there with impressed lines on middle of sides more shallow. Elytra with second interval strongly carinate throughout its length, fourth and sixth more elevated on their apical than basal halves; punctured spaces between the carinae narrower, and with punctures smaller and more rounded than in *lineola*, where they are subtransverse. Length 3.2-4 mm.

An example of this Colydiid was taken at Sanford, Florida, January 14, 1911, and has remained unnamed, awaiting the finding of others. A second was secured at Royal Palm Park, March 22, from beneath the bark of a dead pine. It is very distinct from *lineola* in the characters above mentioned, especially in the shorter more posteriorly convergent thorax. The thoracic punctures of *lineola* are

8.—Trans. Amer. Ent. Soc., XI, 1884, 85.

9.—Proc. Amer. Phil. Soc., XVII, 1878. 361.

much coarser and aciculate. The general color of *lineola*, except that of elytra, is darker, being piceous-brown to black with elytra often darker at apex than base. In the present species they are a uniform shining black distinctly contrasting with the remainder of the insect.

It is possible that this may prove to be the *C. nigripenne* Lec.¹⁰, described from Georgia and South Carolina and placed without comment as a synonym of *lineola* by Horn¹¹, but only a comparison with the type of Leconte will determine this. It is without doubt distinct from Say's species, our only eastern form at present recognized.

(10,742). *Anamorphus pusillus* Lec.—One example of this rare little bristly Endomychid was taken at Royal Palm Park while beating dead limbs in the dense hammock.¹²

(12,449). *Nautus viridimicans* (Horn).—My first specimen of this handsome Tenebriod was beaten from dead limbs in the dense hammock on Paradise Key. It was described¹³ from Tampa and is known only from a few localities in southern Florida.

(12,547). *Orchesia gracilis* Melsh.—A single specimen was sifted February 25, from the rotten debris of an oak snag near Dunedin. It was a most active acrobat, leaping a foot or more a dozen or more times in rapid succession. Not before known from Florida, its recorded range extending from New England to Indiana and Louisiana.

(12,845). *Eutylistus tristriatus* (Lec.)—One specimen taken at the Park while sifting debris of decaying leaves about a picnic table. Heretofore known in Florida only from Key Largo and Dunedin.

(12,861). *Caenocara inepta* Fall.—Four specimens beaten from foliage along the pathways of the hammock on Paradise Key. Enterprise and Crescent City are the two previously known stations in the State.

(13,053). *Canthon perplexus* Lec.—One specimen taken in a pathway of the hammock at Paradise Key. Known before in Florida only from Dunedin.

(14,277). *Cylindera flava* (Fabr.).—A single specimen was beaten from foliage along the margin of Brickell's Hammock at Miami. It is a West Indian species known hitherto in this country only from Key West, and usually listed as *Cyrtomerus pilicornis* (Fab.), a synonym.

(14,549). *Typocerus brunnicornis* Lec.—Two examples of this handsome Lepturid have been taken at Dunedin, March 29, April 11, from the flowers of a cactus. It was described¹⁴ from Texas and is not included in any of the Florida lists, though Leng¹⁵ mentions it from that State without definite locality. It is probably confused in collections with *T. zebra* (Oliv.) which it closely resembles.

(14,702). *Neoclytus cordifer* Klug.—This is another West Indian form, a single specimen of which was taken near Miami by beating dead limbs in Brickell's Hammock. Usually listed as *N. devastator* (Lap.). Not as yet recorded from any definite Florida station but included in the Ms. addition of the Schwarz

10.—New Spec. N. Am. Coleop., I, 1863, 67.

11.—Proc. Am. Phil. Soc., XVII, 1878, 575.

12.—See Can. Ent., L, 1918, 422.

13.—Trans. Amer. Ent. Soc., VII, 1878, 57.

14.—New Spec. N. Am. Col. II, 1873, 214.

15.—Entom. Amer., VI, 160.

list from Key West and Biscayne Bay.

(14,767). *Agallissus chamaeropis* Horn.—A male of this scarce Cerambycid was beaten from the foliage of its host plant, the cabbage palmetto, on Long Pine Key at Royal Palm Park. It was described¹⁶ from Biscayne, Florida and has not been recorded elsewhere.

Leptostylus pusillus sp. nov.

Oblong, very small for the genus. Reddish-brown, everywhere densely and evenly clothed with grayish and fuscous-black prostrate hairs; the dark ones often forming a cross-bar on vertex of head and a narrow median line on thorax, covering the scutellum and sometimes forming an ill defined oblique stripe extending from humerus to middle of elytra, and usually an inverted V-mark behind the middle; antennae and tibiae annulate with pale gray and fuscous-black rings; femora with vague fuscous spots. Antennae longer than body, basal joint stout, feebly curved, narrowed at base, reaching lateral tubercle of thorax. Thorax and elytra with scattered small scale-bearing facets or small tubercles, both sparsely and rather coarsely punctate, the punctures usually hidden by the vestiture. Thorax one-half wider at middle than long, the subbasal lateral tubercle prominent. Elytra with a wide vague median depression in front of middle, their tips separately narrowly truncate. Length 3.8-4.3 mm.

Lakeland, Caxambus, Cape Sable, Moore Haven, Miami and Royal Palm Park, Florida, March 11-27. A rather common species in the southern third of Florida, where it occurs on the foliage of moon-vine and dead limbs in and along the edges of hammocks. It is the smallest known species of the genus.

(15,105). *Spalacopsis suffusa* Newn.—This species, as recognized by Fall, was taken in some numbers near Dunedin in November and December, both on the main land and Hog Island. It is very probable that Casey's *pertenuis* will prove to be a synonym of *suffusa*, as specimens at hand from Chokoloskee and Dunedin, so named by that author, show only minor color differences from *suffusa*.

(—). *Donacia dissimilis* Schaeffer Ms.—The male allotype of this species, soon to be described in a revision of the genus, was taken April 16 from a flower of the yellow water-lily *Nuphar advena* Ait., in a pond east of Dunedin. With the exception of *piscatrix* the members of this genus appear to be very scarce in southern Florida. I have taken only the two mentioned.

(15,864). *Hamletia dimidiaticornis* Crotch.—My first specimen of this rare and handsome Halticid was swept April 16, from tall grasses along the margin of a pond near Dunedin. It is known only from Georgia and Florida, and in the latter State only from Jacksonville and Lake Ashley.

Crepidodera solani sp. nov.

Broadly oval, convex. Pale straw-yellow, shining, glabrous above; antennae and legs concolorous, the last two joints of former sometimes fuscous; ventral surface of abdomen fuscous-brown, the last segment paler. Head smooth, strongly shining. Antennae slightly less than half the length of body, the apical half evidently though slightly thickened. Thorax about one-half wider than long, convex, its sides declivous, with margins feebly curved and front angles obliquely

subtruncate; disk coarsely, evenly not densely punctate; antebasal transverse groove not limited at the sides but extending the full width of thorax, the area behind it with a single transverse row of punctures. Elytra at middle one-third wider than thorax, humeri rounded; umbones wanting; disk with regular rows of punctured striae, the sutural row extending from base to middle. Abdomen minutely sparsely punctate, each puncture bearing a fine prostrate hair. Length 1.5-1.8 mm.

Common at Miami, less so at Royal Palm Park; in both places found only on the potato-tree, *Solanum verbascifolium* L., a common roadside shrub. Allied to *atriventris* Melsh., differing in its paler color and distinctly punctate thorax, the basal groove of which is unlimited at the sides. In some of the specimens the elytra are in places vaguely darker, due to the transmission of the darker hues of the underlying parts through their translucent texture.

(16,020). *Chaetocnema quadricollis* Sz.—This I found the most common flea-beetle at Royal Palm Park, occurring in numbers on weeds along the edges of tomato fields, also in the hammock.

(—). *Longitarsus fuscicornis* Blatch.—Of this little flea-beetle only the type series¹⁷ from Dunedin was known until last March, when a half dozen were swept from roadside herbage at Royal Palm Park.

(16,084). *Aphthona insolita* Melsh.—One example was swept from tall grasses in the everglades at Royal Palm Park. Known in the State heretofore only from Ft. Capron and Miami.

NEW CANADIAN EPHEMERIDAE WITH NOTES, III.*

BY J. McDUNNOUGH,

Ottawa, Ont.

EPHEMERINAE

Neoephemera nov. gen.

Wings hyaline, immaculate; third anal vein on primaries simple, connected with hind margin by only a single crossvein, running almost at right angles to it from approximately its centre and cutting off a large triangular space which may or may not contain a single short marginal intercalary. Costal crossveins obsolescent in basal half of wing, strongly anastomosed to form a network in apical region. Hindwings with very prominent pointed costo-basal projection, with long marginal intercalaries, and with no costal crossveins basad of the projection. Fore leg in male short, tibia and tarsus subequal, tibia from one and a quarter to one and a half times the length of the femur; all claws dissimilar. Male with three anal setae.

Genotype—*Neoephemera bicolor* n. sp.

Neoephemera bicolor n. sp.

Male. Head ruddy brown, pale ochreous along the margin of the eyes. Thorax ruddy brown, paler on anterior portion of mesonotum and on scutellum. Abdomen dorsally ruddy brown with posterior margin of segments narrowly pale yellow and with a broad pale yellow dorsal stripe, tending to broaden posteriorly

17.—Can. Ent., LI, 1919, 65.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

on each segment and specially broad on segments 7-9, where the brown area is reduced to lateral patches; ventrally pale, shaded with brownish laterally and with a blackish dot on each segment just beneath the flange, posterior margins narrowly whitish. Setae whitish, forceps and legs pale yellowish, the fore tarsi slightly smoky. Wings hyaline with colorless veins and crossveins. Length of body 9 mm.; of forewing 10 mm.

Holotype—♂, Laprairie, Que., July 9, 1924 (G. S. Walley); No. 1292 in the Canadian National Collection.

Paratypes—7 ♂, same data.

BAETINAE

Leptophlebia debilis Wlk.

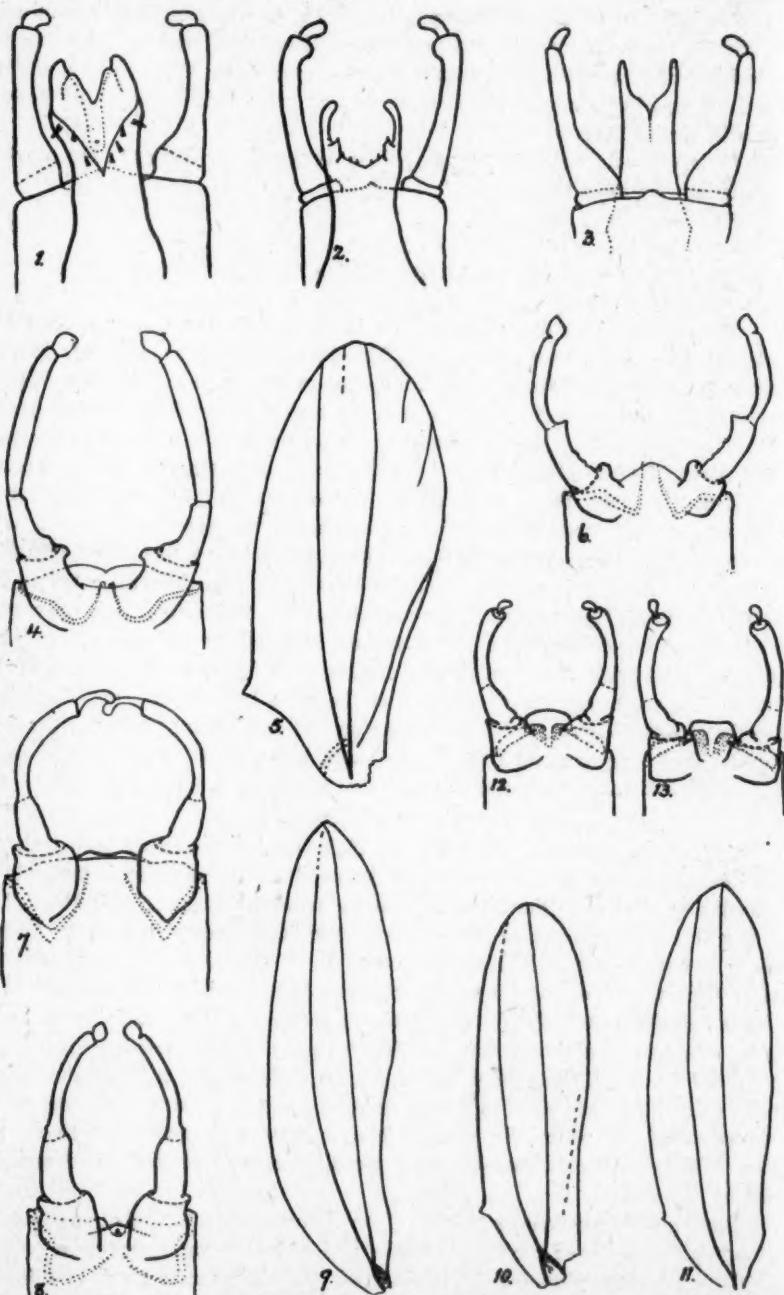
syn. *separata* Ulmer, 1921, Archiv f. Naturg. 87, Abt. A, Heft 6, p. 255.

This species was described from a single female from Nova Scotia and its identity has always been a stumbling block to systematists. Recently Mr. K. G. Blair of the British Museum has kindly compared females of *moerens* McD., *volitans* McD., *guttata* McD., *mollis* Eaton (as restricted by Ulmer) and *johnsoni* McD., which I sent him, with type and he writes me that it does not agree with any of these species. He adds the following valuable notes: "Size of *johnsoni*; legs distinctly brown, the femora darker beyond the middle. Venation, veins and crossveins, distinctly brown, the crossveins of the apical costal area with a distinct and apically increasing outward sweep; vein 2A meets the posterior margin at about 60°; i.e. about parallel with 3A". A single female before me from Kirk's Ferry, Gatineau river, Que., shows all the above mentioned characters and agrees further in the shape of the subanal plate with a sketch Mr. Blair has kindly sent me, made from the type of *debilis*; this female was taken as a subimago on the same day (Aug. 22) and at the same locality as a male which is evidently *separata* Ulmer, judging by the shape of the forceps; it passed its final moult the following day and I regard it as without doubt the female of *separata* which name will fall therefore as a synonym of *debilis*.

Ephemerella excrucians Walsh.

This species, the type of the genus *Ephemerella*, has never been satisfactorily identified. Walsh's type has been destroyed but there exist fortunately at Cambridge specimens of the type lot, sent by Walsh to Hagen (*vide* Proc. Am. Ent. Soc. II. 167) and one of these, a male, has been made the lectotype by Dr. Banks. I have recently had the opportunity of studying this specimen and through the kindness of the Museum authorities have obtained another male from the same lot which undoubtedly agrees with the type. A slide made of the genitalia of this specimen shows that Needham's figure, under the name *excrucians* (1905, Bull. 86 N. Y. State Mus., Pl. X, fig. 8), is incorrect; the true *excrucians* belongs to a different group in which small spines occur on certain lateral and dorsal areas of the penes, the group including, besides *excrucians*, the species *invaria* Wlk., *inermis* Eaton, *dorothea* Needh., *infrequens* McD. and *vernalis* Banks.

Two male specimens before me from Kingston, Ont., match in genitalia the topotypical specimen mentioned above and, although rather paler in coloration, show no characters which would lead one to separate them specifically from the Illinois material. I figure the genitalia (fig. 1.) of one of these speci-



mens; the type of penis is very similar to that of *invaria* Wlk. but the two may be readily separated by the fact that the second joint of the forceps in *invaria* is enlarged apically, as in *infrequens* McD. and *vernalis* Banks. This feature is used by Ulmer in his key (1920, Stett. Ent. Zeit., 81, 119) as a partial means of separating the two genera *Ephemerella* Walsh and *Chitonophora* Btgssn. but in view of the close similarity between the above mentioned species, I cannot believe that this character has more than specific value.

In this connection it might be well to note that the first portion of Ulmer's couplet, separating the two above mentioned genera, is incorrect. It reads as follows:—

4a Femur and tibia of hind leg of about equal length; hind tibia only slightly longer than tarsus *Chitonophora*
4b Tibia of hind leg much longer than the femur and about twice as long as the tarsus *Ephemerella*

For *excrucians*, the genotype of *Ephemerella*, the above statement does not hold as the hind femur and tibia are about equal in length and almost twice as long as the tarsus (35:35:20). A reference to Bengtsson's original characterization of *Chitonophora* would make it seem as if Ulmer had reversed the correct order of the above phrases in his couplet; in any case, however, better characters than those given will be required to separate the two genera.

In the type specimen of *excrucians* the relationship of the joints of the foreleg are as follows.—5:8:4, 4, 3½, 1½; the specimens before me show slight variations from this but in general it may be said that the tibia is less than twice as long as the femur and about equal in length to the first two tarsal joints. At the present time it is doubtful to me whether good generic characters can be drawn from the relationships of the joints of the male foreleg. I am inclined to think that such characters will be found to be merely of specific value.

Ephemerella needhami n. sp.

Male. Thorax deep black-brown, paler laterally and ventrally, pro-and mesosternum tinged with yellowish. Abdomen black-brown with a vinous tinge, much more marked on segment 8-10 and on the whole ventral surface; slight pale intersegmental rings. Forceps smoky, basal portion inwardly and penes pale ochreous: setae dark smoky. Forelegs smoky brown, the tibia rather more than twice as long as the femur and longer than the first two tarsal joints (25:55:25, 25, 20, 12); two hind pairs pale yellow with subequal femora and tibiae of the same length as in *excrucians*; hind femur with slight ruddy streak. Wings hyaline with longitudinal veins very faintly tinged with smoky. Length of body 6 mm., of forewing 6 mm.

Holotype—♂, Laprairie, Que., July 8, (G. S. Walley); No. 1328 in the Canadian National Collection, Ottawa.

Paratype—♂, same locality, July 9.

Judging by the genitalia (fig. 3,) this is evidently the species formerly identified by Prof. Needham as *excrucians*; it appears closest to *tibialis* McD. but has a shorter fore tibia and much paler venation.

Ephemerella septentrionalis n. sp.

Male. Thorax dorsally light yellow-brown, ventrally pale ochreous with yellowish shading. Abdomen with segments 2-7 dorsally light olive brown, semi-

hyaline, with posterior margin narrowly darker, 8-10 opaque, light yellow-brown; ventrally 2-7 hyaline with an ochreous tinge, 8 and 9 opaque, pale yellowish; the usual subventral and lateral rows of dark dots and a small central dark patch situated on posterior margin of each segment; forceps pale yellowish. Hind leg (others missing) pale ochreous, femur darker than other joints and with a faint ruddy apical patch; both femur and tibia unusually long as compared with the preceding species, subequal, and more than twice the length of tarsus (50:50:20). Wings hyaline with entirely hyaline venation. Length of body 8 mm.; of forewing 9 mm.

Holotype—♂, Little Current River, Thunder Bay Dist., Ont., July 11, (W. J. Wilson); No. 1330 in the Canadian National Collection, Ottawa.

The type is not in the best of condition and I should scarcely have ventured to describe the species if the structural characters exhibited in the long hind-leg and the genitalia (fig. 2) had not been so marked. According to Mr. K. G. Blair of the British Museum it is probable that one of Walker's three types of *invaria* belongs here.

***Baetis propinquus* Walsh**

A recent examination at Cambridge of a male specimen of *propinquus* sent by Walsh to Hagen and which I propose to regard as the lectotype, shows that my conception of the species (1923, Can. Ent., LV, 40) was erroneous. The above mentioned type has no costal projection near the base of the hind wings and only veins 1 and 2 are present, without any intercalaries; the true *propinquus* is extremely close to the species I described from Manitoba as *dardanus* and I should not be surprised if the two proved to be identical; until, however, more Illinois material is available for dissection, it will be well to keep the two names separate.

A female in the same collection, also labelled "*propinquus*" by Walsh, shows a prominent costal projection and is probably some other species; in the Manitoba specimens the hind wings are the same in both sexes.

***Baetis pygmaeus* Hagen**

The identity of this species has always been a subject of great doubt. It was described from a single very small specimen taken by Osten Sacken on the St. Lawrence River, probably belonging to the summer generation, in which the specimens average much smaller than those of the spring or late fall broods. Unfortunately all that remains of this unique type at Cambridge is one fore-wing and a portion of the mesothorax with legs attached. A recent careful study of these fragments shows that the legs are pale whitish (as stated in the original description) and that the crossveins of the primaries are *pale*, with no granulation between the costo-apical crossveins and with no marginal intercalaries in the first interspace. Only two of the *Baetis* species from this region known to me comply with these characters, viz: the species I have heretofore referred to as *propinquus* Walsh and a species which I am placing as *parvus* Dodds on account of the forked second vein of the hind wings and of which I have only seen females. These two species can be readily separated on hind-wing characters as in the former species vein 3 is wanting and vein 2 is not forked; I have, however, as yet discovered no good characters for separation in the forewing. Since (as I have shown previously) the name *propinquus* Walsh

has been misapplied and the species going under this name is now apparently left nameless, although one of our commonest Baetids, I propose, rather than further involve the synonymy, to use the name *pygmaeus* Hagen for this species, leaving the other one for the present as *parvus* Dodds.

Baetis brunneicolor n. sp.

Male. Turbinate eyes (living), large, deep brown, stalk rather short and shaded with yellow; head and thorax deep black-brown, the latter shaded with paler brown on lateral anterior edge of mesonotum, the pleural suture and the lateral extensions of the mesosternum and with slight ruddy brown markings on rear portion of mesothorax; anterior mediodorsal projection of metathorax cream colored. Abdomen dorsally deep brown with faint ruddy tinge and with obsolescent pale subdorsal dashes on anterior portion of first six segments; ventrally pale ochreous brown. Legs pale ochreous brown, the fore legs deeper in color and shaded with smoky at apex of tibiae. Forceps and setae dull yellowish white. Wings hyaline with pale venation, costal crossveins with strong granulations in the interspaces; intercalaries well developed, those in the first interspace being much longer than those in the second; hind wing (fig. 5) large, broad, with well-developed third vein, two marginal intercalaries between it and second vein and frequently a small intercalary between veins 1 and 2. Length of body 6 mm.; of forewing 6 mm.

Female. Very similar to male but with dark veins and crossveins; the head is light brown, shaded with yellow-brown along the margins of eyes, especially in the upper corner, and with blackish vertex.

Holotype—♂, Cave Creek, Ottawa W., May 25, 1921, (A. W. Richardson); No. 1283 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality and collector, June 11, 1924.

Paratypes—1 ♂, same data; 5 ♂, same locality, May 27, 1921, (A. W. Richardson and J. McDunnough); 1 ♂, June 11, 1924 (A. W. R.); 4 ♀, same locality, June 12, 1924.

I had at first identified this species as *unicolor* Hagen; this species, however, is based on a female specimen from Washington, D.C., and until the male has been definitely associated, there are no grounds for supposing that this sex also is unicolorous brown. The present species is close in appearance to eastern forms of the *moffatti* group (which I shall discuss in another paper) but the male genitalia (fig. 4) are distinctive, showing a strong apical tubercle on inner margin of the first joint of the forceps and a conical second joint.

Baetis frondalis n. sp.

Male. Head and thorax deep shiny blackish, the pleural sutures marked with brown. Abdomen dorsally deep brown, segments 7-10 opaque, 2-6 with the anterior margins, especially laterally, partially semitranslucent and pale; ventrally pale dull creamy, shaded partially on the posterior opaque segments with brown; forceps and setae pale; legs pale yellow brown; wings hyaline with few costal crossveins, not anastomosing, on primaries, and no marginal intercalaries in first interspace, secondaries (fig. 10) with a greatly reduced basal costal projection, long, narrow, with margins subparallel, vein 3 reduced to a mere trace. The male genitalia (fig. 8) are quite characteristic, the first joint

of the forceps being subquadrate, the second cylindrical, the third long and narrow and the fourth very short and rather truncate apically; between the bases of the first joints is a small triangular plate (penis-cover) covering a deep excavation of the posterior margin of the ninth segment, at the base of which is a small spine. Length of body 5 mm.; of forewing 5-6 mm.

Holotype—♂, Laprairie, Que., July 8, (G. S. Walley); No. 1281 in the Canadian National Collection, Ottawa.

Paratypes—2 ♂, same data; 1 ♂, Ottawa Golf Club, Que., Aug. 8 (F. P. Ide); 1 ♂, same locality, Aug. 25 (G. S. Walley).

Baetis spinosus n. sp.

Male. Turbinate eyes (dried) deep red-brown, slightly smaller than in *intercalaris*. Head and thorax deep shiny blackish with the latero-anterior edge of mesonotum and edges of central portion of mesosternum as well as the pleural sutures pale yellowish or yellowish-brown. Abdomen with segments 2-6 semi-translucent, white or yellow-white with faint black spiracular dots; segments 7-10 opaque, dorsally deep chestnut or chocolate brown, ventrally white; forceps, setae and legs white. Wings hyaline with pale venation on primaries; costal crossveins 8-9 in number without or with scarcely any intervening granulations; no intercalaries in first interspace; secondaries (fig. 11) long, leaf-like, with only a trace of costal projection, vein 3 absent. Length of body 4½ mm., of forewing 5½ mm.

Holotype—♂, Darlingford, Man., July 16, (N. Criddle); No. 1291 in the Canadian National Collection, Ottawa.

Paratypes—13 ♂, same date; 1 ♂, Aweme, Man., July 13, (N. Criddle); 1 ♂, Aweme, Man., Aug. 16 (R. H. White).

In the shape of the secondaries the species is allied to *frondalis* McD. and in general appearance is close to *dardanus* McD. from the same region; the male genitalia (fig. 6) are, however, very characteristic, the second joint of the forceps having a strong pointed projection on the inner apical margin, a feature which is unique in our North American *Baetis* species.

Baetis frivulus n. sp.

Male. Turbinate eyes very large, deep black-brown with paler edges (dried); head and thorax shiny blackish marked with light brown on postero-lateral edge of prothorax, antero-lateral edge of mesothorax, the pleural sutures (which are tinged with reddish), the lateral edges of the mesosternum and its side projections and the postero-lateral edge of mesothorax near the scutellum. Abdomen dorsally deep brown, all segments opaque, with traces of a broken black spiracular line; ventrally dull ochreous, shading into whitish posteriorly; forceps and setae white. Fore legs smoky brown, two hind pairs pale yellowish. Wings hyaline with pale venation, costal cross-veins 6-7 in number and well anastomosed, intercalaries well-developed, except the upper one in the first interspace which is rudimentary or absent; hind wings (fig. 9) entirely without basal costal projection, long, narrow, vein 3 lacking. Male forceps (fig. 7) with the second joint cylindrical, the fourth joint longer than usual, fully three times as long as wide and slightly knob-shaped at extremity; the posterior margin of ninth segment shows a small raised plate between the bases of the forceps. Length of body 5 mm., of forewing 6 mm.

Female. Head pale ochreous brown shaded with yellowish, particularly on the vertex next the eyes. Thorax dorsally bright light brown, or yellow-brown, tinged with pale yellow along the lateral edges and in the sutures and with the posterior portion of the mesonotum (scutellum) entirely yellowish; abdomen dorsally bright brown. Beneath pale yellow-white, with sternum at times tinged with brown. Legs pale yellowish, fore femora deep ruddy brown. Forewings hyaline with pale venation; secondaries much smaller than in the male sex and with only vein 2 visible. Length of body 4 mm.; of forewing 5 mm.

Holotype—♂, Wakefield, Que., June 25, (J. McDunnough); No. 1282 in the Canadian National Collection, Ottawa.

Allotype—♀, Wakefield, Gatineau river, Que., June 25 (J. McDunnough).

Paratypes—1 ♂, 2 ♀, same data; 1 ♀, Aylmer, Que., July 5, (C. H. Curran); 1 ♀, Ottawa, Ont., July 17, (F. P. Ide).

The species would fall into Bengtsson's genus *Acentrella* (1912, Ent. Tidskr., 110), along with *dardanus* McD., on the strength of the shape of the hindwing (no costal projection); in view, however, of the much reduced projection in the preceding species I am inclined to think that the character is hardly of generic value and prefer to retain *frivulus* and *dardanus* for the present in *Baetis*.

Heterocloeon n. gen.

(Type, *Centroptilum curiosum* McD.)

At the time of description (1923, Can. Ent., LV, 43), I called attention to the fact that a new genus might be necessary for the reception of this species and I now propose the above name. The genus is allied to *Baetis* in the paired intercalaries of the primaries, differs, however, in the great reduction of the secondaries, which have become a mere thread without costal projection and only occasional traces of a single vein (vein 2). In the male foreleg the tarsus is one half to two thirds the length of the tibia. *Heterocloeon* is evidently intermediate between *Baetis* and *Pseudocloeon*, in this latter genus the reduction of the secondaries having been continued to complete obliteration of same. The short foreleg seems characteristic.

***Centroptilum caliginosum* n. sp.**

Male. Turbinate eyes (dried) deep black-brown with paler edges; head and thorax deep brown with the sutures and lateral edges of mesonotum and a small patch preceding the scutellum paler brown. Abdomen with segments 2-6 pale translucent, very faintly tinged with brown, especially along the posterior and lateral margins of segments, 7-10 chocolate brown, paler ventrally; forceps and setae whitish. Legs dull whitish, fore legs tinged with smoky. Wings hyaline with pale venation, 6-7 costal crossveins, marginal intercalary missing in interspaces 1 and 2, first cross vein between radius and the radial sector slightly basad of the second one; hindwings long, narrow, with a strong costal hook.

Female. Head pale ruddy brown with slight yellowish shading centrally; thorax and dorsum of abdomen dark brown; ventrally segments 2-6 are dull hyaline with brown semitriangular shades in the anterior lateral corners. Legs all whitish. Wings as in male. Length of body 6 mm.; of forewing 6½ mm.

Holotype—♂, Lachine, Que., Aug. 6, (G. S. Walley); No. 1285 in the

Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratype—1♀, same data.

The species is allied to *rufostrigatum* McD. but is considerably larger and shows no trace of ruddy maculation; the male forceps show a much stronger inward bulge at the apex of joint 2 than is found in *rufostrigatum*.

A PRELIMINARY REVISION OF THE CAMPOPLEGINAE IN THE
CANADIAN NATIONAL COLLECTION, OTTAWA.*

BY HENRY L. VIERECK,

Ottawa, Ont.

Although the following contribution to our knowledge of Nearctic Camponopleginae is based primarily on the species represented in the Canadian National Collection, I have also included certain of my species, the types of which are in the University of Kansas and the Connecticut Agricultural Experiment Station, New Haven, Connecticut. Some of the species here treated will no doubt prove to be races or varieties when more material has been studied but until that time the names here proposed will be useful.

KEY TO THE GENERA OF CAMPOPLEGINAE

Propodeum at most usually not attaining end of basal third of hind coxae, if extending to or beyond the basal third of hind coxae then with the chitinous part of first sternite not extending beyond the spiracles of first tergite.

1. Propodeum apparently not extending to end of or beyond the basal half of hind coxae 4.
- Propodeum apparently extending to or beyond the end of the basal half of hind coxae 2.
2. Petiole without a fossa on each side 3.
- Petiole with a fossa on each side *Campoctonoides* new genus
3. Thorax not elongate as in *Pseuderipternus*; propodeum exareolate or areolate *Neonortonia* Vier.
- Thorax elongate as in *Pseuderipternus*; vertical axis shorter than the horizontal axis; propodeum areolate *Pseuderipternoides* Vier.
4. Mesosternum with its posterior edge without a process on each side of mesolcus 5.
- Mesosternum with its posterior edge with a process on each side of mesolcus *Lathrostizus* Thomson
5. Propodeal spiracles elongate; petiole with a foveolate furrow on each side; second abscissa of the discoidal vein as long as or longer than third, nervellus almost vertical, curved, not broken, head not lenticular, not receding vertically from the hind ocelli 6.
- Propodeal spiracles round or nearly round or if elliptical then with the petiole without a foveolate furrow or with at most a minute punctiform fossa 7.
6. Distance between hind ocelli and occipital carina equal to or distinctly less than distance between hind ocelli; spiracles of first tergite as near or

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

nearer to each other than to the apex *Zachrestoides* new genus
 Genotype: *Z. euphydryadis* n. sp.

Distance between hind ocelli and occipital carina distinctly greater than the distance between hind ocelli; areolet wanting; spiracles of first tergite as near or nearer to the apex than to each other *Benjaminia* Vier.

7. Eyes not distinctly hairy nor distinctly converging below 8.
8. Eyes distinctly converging below especially in the female *Cymodusa* Holmg.
9. Abdominal petiole cylindrical 10.
10. Abdominal petiole depressed, wider than thick dorso-ventrally 9.
11. Nervellus angulated *Sesioplex* Vier.
 Nervellus not angulated *Campoletidea* Vier.
12. Head cubical 11.
13. Head not cubical 13.
14. Clypeus simple 12.
15. Clypeus with its anterior edge produced medially into a more or less distinct tooth *Pyracmonoides* new genus
16. Petiole with a fossa, areolet sessile *Pyracmon* Holmg.
 Petiole without a fossa, areolet petiolate or wanting *Zaporus* Foer.
17. Clypeus normal 14.
18. Clypeus extending on each side as far as the base of the mandibles *Zaplatystoma* new genus
19. Clypeus with its anterior edge mucronate or nearly so *Sagaritis* Holmg.
 Clypeus with its anterior edge simple *Campoplex* Grav.

KEY TO THE SPECIES OF CAMPOCTONOIDES VIERECK

1. Petiole pale *currani* n. sp.
2. Petiole black 2.
3. Mid femora mostly reddish 3.
4. Mid femora mostly black *beaulnei* n. sp.
5. Hind coxae black or blackish 4.
6. Hind coxae reddish *johanseni* n. sp.
7. Petiole with a deep fossa *buckelli* n. sp.
8. Petiole with a punctiform fossa *harringtoni* n. sp.

KEY TO THE SPECIES OF SESIOPLEX VIER.

1. Anterior edge of the clypeus simple 2.
2. Anterior edge of the clypeus mucronate 4.
3. Abdomen partly reddish 3.
4. Abdomen entirely black *validus* Cress.
5. Most of third tergite reddish *relativus* n. sp.
6. Base of third tergite reddish *depressus* Vier.
7. Areolet petiolate *heliaeformis* n. sp.
8. Areolet subsessile *heliae* Ashm.

KEY TO THE SPECIES OF PYRACMONOIDES NEW GENUS

1. Hind tibiae and tarsi without white annuli 2.
2. Hind tibiae and tarsi with white annuli or stripes, fore and mid coxae mostly pale *atypicum* n. sp.
3. Face black; tegulae yellowish or whitish 5.

Face not black; most tergites not reddish 3.

3. Most tergites black, hind coxae black, their tibiae and basitarsi without annuli *lipoparium* n. sp.

Abdomen black; fore and mid-trochanters white 4.

4. Hind femora reddish, hind coxae succineous, fore and mid trochanters white, hind tibiae and basitarsi without annuli; abdomen black *succineum* n. sp.

Hind femora blackish, fore and mid-trochanters white, abdomen black, face not black, hind tibiae and basitarsi without white annuli *trochantericum* n. sp.

5. Hind coxae black; areola and petiolarea not confluent; abdomen black; mandibles with a piceous spot *separatum* n. sp.

Hind coxae reddish, hind femora above more or less fuscous; ovipositor much shorter than the abdomen, tegulae yellowish or whitish, face black, hind tibia and tarsi without white annuli *macrocephalum* Prov.

KEY TO THE SPECIES OF *NEMERITIS* HOLMGREN.

1. Areolet wanting 2.

Areolet present *canescens* Grav.

2. Apical margins of second and following tergites reddish *argyresthiae* Roh.

Apical margins of second or at least the following tergites black or blackish 3.

3. Mid coxae black basally 4.

Mid coxae concolorous 7.

4. Scape beneath yellowish white *cupressi* Ashm.

Scape beneath not yellowish white 5.

5. Hind tibiae not annulate *uniformis* n. sp.

Hind tibiae annulate 6.

6. Hind femora reddish *erythromerus* n. sp.

Hind femora blackish *melanomerus* n. sp.

7. Mid coxae entirely black 13.

Mid coxae entirely pale 8.

8. Hind femora black *minutus* Ashm.

Hind femora reddish or stramineous 9.

9. Second and third tergites black *lyonetiae* n. sp.

Second and third tergites partly pale 10.

10. Scape blackish above 11.

Scape pale above 12.

11. Ovipositor apparently twice as long as the apical truncature of the abdomen *dolichourus* n. sp.

Ovipositor apparently only as long as the apical truncature of the abdomen *brachyurus* n. sp.

12. Greatest diameter of lateral ocelli apparently longer than the ocellocular line *oculus* n. sp.

Greatest diameter of lateral ocelli apparently at most as long as the ocellocular line *ocellatus* n. sp.

13. Hind tibiae annulate 14.

Hind tibiae not annulate *conodor* n. sp.

14. Hind tibiae with a basal and median whitish annulus 15.

Hind tibiae with solely a basal whitish annulus *solus* n. sp.
 15. Areola finely sculptured 16.
 Areola coarsely sculptured *trachas* n. sp.
 16. Hind tarsi with basitarsus whitish except at extreme apex and with more
 than the basal half of the following joint whitish *decoratus* n. sp.
 Hind tarsi brownish except for the basal two-thirds of the basitarsus which
 is whitish *laevis* n. sp.

KEY TO THE SPECIES OF *NEONORTONIA* VIERECK.

1. Abdomen black above; propodeum exareolate 8.
 Abdomen more or less reddish above 2.
2. Hind tibiae black 3.
 Hind tibiae more or less reddish 4.
3. Postpetiole black *nigripes* n. sp.
 Postpetiole reddish; fore-coxae stramineous below, mid-coxae mostly nearly
 entirely black *graciliforma* n. sp.
4. Postpetiole reddish 5.
 Postpetiole black 6.
5. Propodeum apparently not extending to the middle of the basal half of the
 hind coxae *hullensis* n. sp.
 Propodeum apparently extending beyond the basal half of hind coxae
 autumnalis Vier.
6. Scape yellowish *scaposa* n. sp.
 Scape black or blackish 7.
7. Areola finely sculptured *laevissima* n. sp.
 Areola coarsely sculptured *crassata* n. sp.
8. Propodeum areolate *eupitheciae* Viereck.
 Propodeum exareolate *genuina* Norton

KEY TO THE SPECIES OF *PSEUDERIPTERNOIDES*.

1. Areola nearly parallel sided 2.
 Areola hexagonal or pentagonal 3.
2. Third tergite entirely reddish 3.
 Third tergite blackish at apex ♂ *melanerythrogaster* Vier.
3. Spiracularea apparently not twice as long as wide ♀ *melanerythrogaster* Vier.
 Spiracularea distinctly more than twice as long as wide 5.
4. Hind coxae black *neglectus* n. sp.
 Hind coxae reddish ♂ *melanerythrogaster* Vier.
5. Postpetiole reddish ♂ *porrectus* Cress.
 Postpetiole virtually entirely black *pulchellus* n. sp.
6. Hind coxae blackish *deceptor* n. sp.
 Hind coxae reddish; abdomen black at apex *hexagonalis* n. sp.

KEY TO THE SPECIES OF *ZACRESTOIDES* NEW GENUS

Abdomen black, fore and mid-coxae entirely black, areolet present, petiolate *intermedia* n. sp.
 Abdomen mostly reddish; areolet wanting *euphydryadis* n. sp.

KEY TO THE SPECIES OF *CYMODUSA* HOLMGREN.

1. Areolet present 2.
 Areolet wanting *coxalis* Cuss.

2. Hind coxae black 3.
 Hind coxae reddish *provancheri* Vier.
 3. Scape yellow beneath *fusiforme* Prov.
 Scape black beneath *melanocera* n. sp.
 4. Second tergite black throughout; ovipositor one fourth length of abdomen,
 petiole with a fossa on each side *mississippiensis* Ashm.
 Second tergite with its apical edge yellowish; sheaths of ovipositor nearly
 as long as first tergite *simplicicornis* Vier.
 5. Proximal trochanter of hind legs black 6.
 Proximal trochanter of hind legs stramineous; petiole without a fossa on
 each side *distincta* Cress.
 6. Flagel not partly whitish 7.
 Flagel partly whitish *plesius* Vier.
 7. Costulae present *gracilicornis* Vier.
 Costulae wanting *melanocera* n. sp.

KEY TO THE SPECIES OF PYRACMON HOLMG.

1. Hind tibiae with a white annulus or stripe, fore and mid-coxae mostly
 black 2.
 Hind tibiae and basitarsi without a white annulus 5.
 2. Hind tibiae with a white stripe *ruficinctum* n. sp.
 Hind tibiae with a basal annulus 3.
 3. Petiole without scrobes *albicinctum* n. sp.
 Petiole with scrobes 4.
 4. Petiole with well developed scrobes, areolet present *fossatum* n. sp.
 Petiole with rudimentary scrobes, areolet wanting *patulum* n. sp.
 5. Face not black 6.
 Face black 9.
 6. Most tergites reddish 7.
 Most tergites not reddish, abdomen mostly black; fore and mid-trochanters
 white or yellowish, hind femora reddish 8.
 7. First, second and third tergites reddish at base *vancouverensis* Hgtn. var.
 First, second and third tergites black at base *sericeum* Prov.
 8. Hind coxae black 8. *aldrichi* Davis
 Hind coxae mostly reddish *vancouverensis* Hgtn.
 9. Tegulae yellowish or whitish, hind coxae black 10.
 Tegulae dark brownish to blackish, hind coxae black *macdunnoughi* n. sp.
 10. Abdomen black 12.
 Abdomen at least partly reddish 11.
 11. Scape white beneath *barbata* Prov.
 Antennae entirely black *valens* Cress.
 12. Mandibles whitish 10.
 Mandibles with a piceous spot, areola and petiolarea confluent *conocola* Roh.
 13. Abdomen finely punctured *idahoensis* Davis
 Abdomen finely shagreened *aldrichi* Davis

KEY TO THE SPECIES OF ZAPLATYSTOMA NEW GENUS.

1. Abdomen black; fore and mid-coxae white *annulatum* Prov.
 Abdomen partly reddish 2.

2. Costulae nearly completely developed 3.
 Costulae wanting or rudimentary 4.
 3. Postpetiole laterally and apically reddish *ocellatum* n. sp.
 Postpetiole nearly entirely black *egregium* n. sp.
 4. Mid coxae black 5.
 Mid coxae pale 7.
 5. Hind femora mostly or entirely reddish *mimeticum* n. sp.
 Hind femora mostly blackish 6.
 6. Fore femora partly black or dark 11.
 Fore femora uniformly brownish stramineous *simplex* n. sp.
 7. Hind femora blackish 8.
 Hind femora reddish 9.
 8. Areola distinctly longer than wide *typicum* n. sp.
 Areola hardly longer than wide *latum* n. sp.
 9. Pubescence of head and thorax silvery 10.
 Pubescence giving head and thorax a cinereous appearance *cinereum* n. sp.
 10. Petiolarea sessile (*Holocremnus*) *metacometi* Viereck.
 Pétiolarea petiolate *petiolatum* n. sp.
 11. Abdomen mostly black *decorum* n. sp.
 Abdomen mostly reddish *johnsoni* n. sp.

A LIST OF MIRIDAE AND ANTHOCORIDAE FROM ALBERTA,
 CANADA (HEMIPTERA).

BY HARRY H. KNIGHT,

Ames, Iowa.

The following records were taken from Alberta material collected by Dr. J. McDunnough at Nordegg, in 1921, and Waterton Lakes, in 1923. Little is known regarding the distribution of Hemiptera in western Canada, thus it seems worth while to publish the list. Three of these species have been described as new in the preceding pages while one is a Palearctic species here recorded from the Nearctic region for the first time.

Chlamydatus pulicarius (Fallen). Waterton Lakes, July 22, 1923. 5♀.

Chlamydatus pullus Reuter. Nordegg, July 31, 1921. 8♂ 9♀. This is the first Nearctic record for a species known heretofore only from the Palearctic region. *Pullus* Reut. is smaller than *pulicarius* (Fall.), and of a deeper black color, having all the femora black except their apices; antennae black with the apical half of segment II more or less yellowish.

Chlamydatus obliquus Uhler. Waterton Lakes, July 22, 1923. 5♀.

Chlamydatus bakeri Bergroth. Nordegg, July 29-31, 1921. 8♂ 9♀.

Plagiognathus obscurus fraternus Uhler. Nordegg, July 29-31, 1921. 38♂ 9♀.

Plagiognathus alboradialis Knight. Nordegg, July 3, 1921. 9.

Plagiognathus laricicola Knight. Nordegg, Aug. 4, 1921. 10♂ 9♀.

Plagiognathus moerens Reuter. Waterton Lakes, July 4-11, 1923. 4♂ 9♀.

Psallus drakei Knight. Nordegg, July 31, 1921. 8. I have recently received this species from Wolfville, Nova Scotia (June 27, 1920, W. H. Brittain).

Dicyphus agilis Uhler. Nordegg, July 25, July 29, Aug. 6, 1921.

Labops hesperius Uhler. Nordegg, July 29, July 31, 1921.

Hadroneura militaris Uhler. Waterton Lakes, July 4-11, 1923.

Hadroneura princeps Uhler. Waterton Lakes, July 22, 1923.

Ilacocarella sulcata Knight. (p. 93). Waterton Lakes, July 4-11, 1923.

Lopidea minor Knight. Waterton Lakes, July 4-11, July 22, 1923. 12 ♂ ♀.

This species has been known heretofore only from Colorado, Kansas, and North Dakota.

Lopidea sericea Knight. Waterton Lakes, July 4-11, 1923. 8 ♂ ♀.

This species has been known previously only from Colorado.

Labopidea nigrisetosa Knight. (p. 94). Nordegg, July 31, 1921. ♀.

Orthotylus coagulatus (Uhler). Waterton Lakes, June 22, 1923. ♂.

Orthotylus dorsalis (Provancher). Nordegg, July 26, July 29, July 31, 1921. 4 ♂ ♀.

Orthotylus alni Knight. Nordegg, July 26, 1921. ♂.

Orthotylus sp. ? ♀. Nordegg, Aug. 1921.

Ceratocapsus drakei Knight. Nordegg, July 24, 1921.

Megaloceroea debilis Uhler. Nordegg, Aug. 3, 1921. 4 ♂ ♀.

Stenodema virens (Linnaeus). Nordegg, June 15, July 26, July 31, 1921. Waterton Lakes, June 24-27, 1923.

Stenodema trispinosum Reuter. Nordegg, July 5, 1921.

Capsus ater (Linnaeus). Nordegg, July 31, 1921. ♀.

Irbisia nigripes Knight (p. 94). Waterton Lakes, June 24, 1923.

Lygus pratensis (Linnaeus) var. Nordegg, July 29, July 31, Aug. 6, 1921. Waterton Lakes, June 24, 1923.

Lygus elisus Van Duzee. Nordegg, July 31, 1921. ♀.

Lygus humeralis Knight. Waterton Lakes, June 30, 1923. ♂.

Lygus columbiensis Knight. Nordegg, June 25, 1921. ♂ ♀.

Lygus striatus Knight. Waterton Lakes, July 4-11, 1923. ♀.

Lygus distinguendus Reuter. Nordegg, August 3, 1921. ♂.

Lygus campestris (Linnaeus). Waterton Lakes, June 24, 1923. ♀.

Lygus approximatus Stal. Nordegg, Aug. 4, 1921. 6 ♂ ♀. "from Larch."

Neolygus atritylus Knight. Nordegg, Aug. 3, 1921. ♀.

Neolygus confusus Knight. Nordegg, Aug. 3, 1921. ♀.

Neolygus communis Knight. Nordegg, July 29, Aug. 3, 1921. 21 ♂ ♀.

Polymerus unifasciatus lateralis (Hahn). Nordegg, July 31, Aug. 3, 1921. 6 ♂ ♀.

Polymerus basivittis pallidulus Knight. (p. 95). Waterton Lakes, July 22, 1923. 5 ♂ ♀.

Adelphocoris rapidus (Say). Waterton Lakes, July 4-11, 1923. 13 ♂ ♀.

Phytocoris junceus Knight. Nordegg, July 30, Aug. 1, 7, 1921.

This species was described from Mt. Washington, New Hampshire, and Nordegg, Alberta. Since the original publication a specimen has been received from Montana (♂ Aug. 6, 1920, Bozeman).

Triphleps insidiosa (Say). Nordegg, Aug. 4, 1921.

Tetraphleps americana Parshley. Nordegg, Aug. 4, 1921.

Series taken on larch (*Larix*) by Dr. McDunnough. These specimens agree perfectly with the original description except that length of antennal segment II is a trifle greater than width of head across eyes. ♀ Head: width .48 mm.; antennal segment II, length .52 mm. ♂ Head: width .48 mm.; antennal segment II, length .53 mm.

Mailed July 24th, 1925.

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